

We thank reviewer #1 for his/her comments. Here are our responses to the specific comments. Changes to the text in the manuscript are printed in italic.

Comment: There is a concern related to main compounds emitted from plants and the ozonolysis experiment with the formation of acetone. Firstly, according with Blanch et al., 2007 and Llusia and Penuelas, 1999, almost all the compounds presented in text in section 3.5 and in figure 6 are considered mainly emitted by *Quercus Ilex* in different conditions of temp, fertilization, drought, etc. However, in section 3.5 line 15 there are presented the main compounds emitted from the plants as including Z-beta-ocimene, the compound which is missing from figure 6. Please make consistency between fig. 6 and the text of section 3.5. Most probably should be reconsidered the figure 6 and add the not considered compounds in section 3.5.

Response: Thanks for the reviewer to point out the inconsistency between Fig. 6 and the text and table 4. Accidentally an older result for figure 6 was uploaded for the manuscript which contains an incorrect legend/identification of the *Quercus ilex* emission pattern. The identification of the compounds during the analysis process changed after several careful examinations but not the contribution. During the analysis it turned out that what was previously identified as delta-3-carene and beta-phellandrene were (Z)-beta-Ocimene and (E)-beta-Ocimene, respectively. Therefore the legend in Fig. 6 should actually read (Z)-beta-Ocimene instead of delta-3-carene and (E)-beta-Ocimene instead of beta-phellandrene. The figure was corrected in the manuscript. The statements in section 3.5 and in Table 4 are correct as is. Also the calculations for the acetone yield presented in section 3.6 are based on the compounds in section 3.5 and Table 4 which are now consistent with Fig. 6.

Comment: Secondly, both calculated and measured acetone fit well. However, there are some comments which need to be addressed, which are linked somehow with previous comment. Table 4 must include the contribution to acetone formation from delta3-carene and beta-phellandrene for both reactions with OH and ozone, respectively. If there it is a reason for not including these compounds please specify. Probably section 3.6 needs to consider the new fit of the calculated acetone concentration after contribution of carene and phellandrene to the total acetone yield.

Response: See previous response.

Comment: How much acetone is added directly from PLUS chamber into the SAPHIR chamber? That 680 pptv maximum acetone concentration includes background acetone as it was measured from PLUS outlet or it was not significant to be considered?

Response: The acetone concentration shown in Fig. 9 is already corrected for background acetone measured in SAPHIR. The acetone background concentration in SAPHIR before the injection of ozone and the coupling of PLUS to SAPHIR was constant and on average 0.22 ppbv. This value was subtracted from the data shown in Fig. 9 assuming no change in background concentrations after ozone addition. This information was also added to the manuscript reading now *"Note that the background concentration of acetone in SAPHIR prior to the injection of ozone could be considered constant and was on average 0.22 ppbv. The acetone time series shown in Figure 9 are corrected for the background concentration."*

Note that acetone from the PLUS chamber can only contribute during the phase when both chambers were coupled. As can be seen from Fig. 9 no significant increase in acetone is observed in SAPHIR during the coupling phase and prior to ozone injection. After decoupling both chambers and shortly before ozone injection no additional acetone is introduced into SAPHIR anymore. So the

acetone concentration in PLUS cannot influence the actual acetone production phase after the oxidation process of the BVOC has started.

Comment: How much ozone was added into the SAPHIR during ozonolysis? Please specify conditions of temperature and humidity in SAPHIR before ozone addition?

Response: We added the information to the manuscript. The manuscript reads now: “30 ppbv of ozone was injected into SAPHIR after the transfer of BVOC from PLUS was completed. The initial conditions inside the chamber prior to injection were 47 % relative humidity at a temperature of 17 °C.”

Comment: Why authors are not providing data on OH radical formation as there are all the facilities to perform these measurements?

Response: OH measurements were not available at the time of the experiments.

Comment: Why authors do not provide any information for SOA formation as the PLUS chamber will be used for testing SOA formation from complex plant emissions?

Response: This paper focus is on the set up, operation, and characterization of e.g. transfer efficiency etc of the new plant chamber PLUS. As an example a BVOC experiment was conducted where the production of an atmospheric relevant trace gas such as acetone is briefly analyzed to show the potential future work which can be achieved. Detailed analysis of e.g. SOA formation, yields and chemical characterization are beyond the scope of this paper and therefore are not discussed in this technical paper.

Comment: Please order by decreasing year the multiple in text citations.

Response: Citations are reordered accordingly.

Comment: P11780 Please be consistent with the description of abbreviations in Abstract as only some of them are described and some of them not (e.g. PAR, RH,).

Response: We added the description were only the abbreviations were used. “*photosynthetically active radiation (PAR)*, *relative humidity (RH)*”, “*fluorinated ethylene propylene (FEP)*”, and “*light-emitting diode (LED)*”

Comment: P11780 line 11 replace “leafes” with “leaves”

Response: Corrected

Comment: P11790 Please provide in section 3.2 a concentration of the contaminants level at inlet and not only inlet vs outlet relative increase. In section 3.2 line 14 specifications of contaminant concentrations to be 3 order of magnitude lower it is probably too ambitious. Probably “2 to 3 order of magnitude lower” it is more adequate.

Response:

The purpose of the experiments in 3.2 is to determine a possible addition of compounds which might emit from the plant chamber. Since in general for experiments the very pure synthetic air mixed from the liquid oxygen and nitrogen is used (see also comment to Referee #3 response to comment 2) which is also used in SAPHIR the relative increase gives exactly the amount of background concentrations which is only due to the plant chamber. When both chambers are coupled the air supply is the same so the relative increase of background concentration determines what is flushed

additionally into SAPHIR. Therefore we believe that it is more instructive to report the relative increase instead of the absolute inlet values.

Comment: p11792 how the RH increased to only 3% in second experiment as there the starting RH was 100% in comparison with first one where starting RH was 64% and in SAPHIR was 7% after addition?

Response: The increase in RH in SAPHIR stated in the manuscript is for the total duration of the experiments over the course of the day. That means the total duration the plant chamber PLUS was coupled to SAPHIR and water vapor was transferred from the humidified PLUS chamber to the “dry” SAPHIR chamber. On the first experiment day the total coupling duration was 6 hours (2 hours per RH step) and on the second experiment day for the 100 % RH step one coupling with a duration of 3 hours was used. Therefore the increase in SAPHIR was 4 % less at the 100 % RH experiment compared to the total increase during the first set of transfer efficiency experiments. To reflect that circumstance the text in the manuscript was changed to “The RH changed in SAPHIR from 1% to about 7% RH for the first experiment (*for a total coupling duration for all RH steps of 6 hours*) and 0.5% to 3% for the second experiment (*for a total coupling duration of 3 hours*).”

Comment: P11794 line 1 replace “caluclated” with “calculated”

Response: Corrected

Comment: P11794 line 9 use subscript for “CO₂”

Response: Corrected